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AirLand Battle Future: Combat Engineer Force Structure

A Monograph
by

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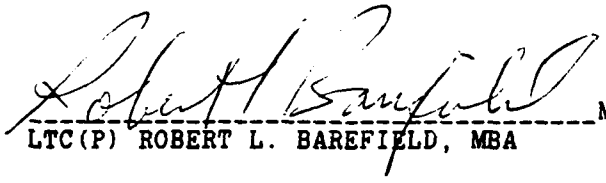

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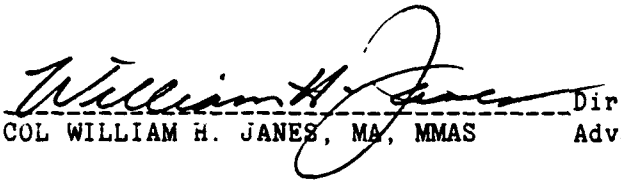

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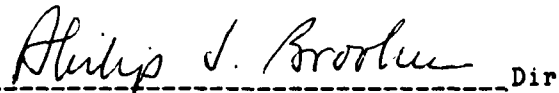

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ABSTRACT

AIRLAND BATTLE FUTURE: COMBAT ENGINEER FORCE STRUCTURE
by Major Jerry T. Mohr, USA, 43 pages

Military writers believe that future warfare is about to undergo fundamental change. Due to extremely sophisticated intelligent weapons and the lack of economic resources, countries are moving away from mass conscripted draftee armies toward smaller, highly trained professional armies. In addition to greater battlefield lethality introduced by the new 'brilliant' weapon systems, social forces in the Western world demand that military leaders avoid attrition warfare and conserve the lives of soldiers. The solution to these societal forces is the prosecution of warfare on a nonlinear battlefield. The purpose of this monograph is to examine the US Army's revised operational concept that extensively modifies AirLand Battle. The title of the revised operational concept is AirLand Battle Future.

This monograph provides a detailed explanation of the AirLand Battle Future concept and explores the theoretical principles from Sun Tzu and William S. Lind upon which AirLand Battle Future is largely derived. Then the monograph examines and analyzes the supporting engineer doctrine and proposed engineer force structure developed by the Engineer School at Fort Leonard Wood, Missouri. The analysis reveals that the Engineer School streamlined engineer force structure distributing engineer assets among maneuver forces where they need them on a regular basis. Those engineer assets used infrequently are consolidated at corps level to enable the corps commander to shift engineer assets when needed. In addition, the Engineer School created an engineer force structure that can provide significantly improved mobility support. However, the proposed engineer force structure does not yet provide the mobility support needed by M1A1 Abrams tanks and M2 Bradley fighting vehicles. The Army must alleviate this shortcoming by fielding new generation mobility vehicles (in particular, the combat mobility vehicle (CMV) and the heavy assault bridge (HAB)) that replace the present day combat engineer vehicle (CEV) and the armored vehicle launched bridge (AVLB).

TABLE OF CONTENTS

APPENDICES

I. INTRODUCTION

In the past year, the media documented a series of reversals for several communist governments. The changes were astonishing to say the least. The Berlin Wall shattered into pieces. East Europeans overthrew their communist masters. Soviet republics declared their sovereignty. Everywhere, the 'proletariat' rejected communist philosophy. As a result, American political support for new defense spending evaporated. Moreover, Congressional leaders called for huge reductions in the defense budget. Unfortunately, at about the same time, the country's economic problems began to attract increasing public attention.

For more than a decade, the government spent more money than it received as revenue. As a result, the country's deficit continued to grow daily. The interest on government borrowing alone annually exceeded hundreds of billions of dollars. In the past year, government regulators revealed a savings and loan scandal that promises a tremendous increase in the deficit--on the order of $500 billion.(1) In addition, they reported that faulty financial planning threatens other financial institutions with collapse, such as the student loan corporation and many of the country's banks. As further evidence of the country's budget problems, an embarrassed Congress struggled to produce a deficit cutting plan and keep the government operating as fiscal year 1991 began. But worst of all, US economists believed it's not a question of whether an economic recession will occur, but rather, how strong it will be and how long it will last.(2) These political changes and fiscal problems portend meager funding for the Army in the foreseeable future. Hence, the Army has prepared

plans for a smaller force structure. Ironically, the Army began to reduce its force structure at the same time as the United States began to mobilize for war in the Persian Gulf against Iraq.

Using its one million man strong army, Iraq seized, pillaged, and plundered Kuwait, digging 400,000 soldiers in strong defensive positions in great depth in Kuwait and Iraq.(3) Unsure of Iraqi intentions toward Saudi Arabia, the US deployed 400,000 troops to protect the world's free market access to Saudi oil fields. The realization of war involving assaults against several strong defensive belts in great depth raises the question whether the United States can tolerate sustaining enormous casualties in a grinding attritional war.

Two aspects drive the need to consider the threat of attritional warfare: history and technology. Recent US history shows that the American people can quickly reverse their support for wars involving extensive casualties. For example, America's many dead, wounded, and missing service members occurring during the protracted Vietnam War generated a strong anti-war movement that eventually forced the US government to end its participation. Equally important to this issue of attrition is the promise of future technology. The tremendous advances in technology, to be fielded in the near future, include very long range and highly accurate indirect fire systems, extremely sensitive electronic sensors, and brilliant weapon systems that can discriminate high payoff targets from others. These systems are expected to magnify battlefield attrition more than ever before. And, sooner or later, America's adversaries are expected to possess them.

These changes pose a dilemma to the Army. Reductions in force structure raise a higher possibility of attritional warfare. On the

other hand, to avoid attritional warfare demands a large enough force to handle the most likely contingencies in the near future. This dilemma drives the Army to search for a solution.

The Training and Doctrine Command (TRADOC) is moving to revise the Army's operational concept. The name of the revised concept is AirLand Battle Future (ALBF). It proposes waging war with smaller forces on a nonlinear battlefield where the Army expects to avoid attritional warfare.(4) Similarly, each TRADOC branch school including the Engineer School is busy developing its supporting concept.

At Fort Leonard Wood, Missouri, the Engineer School is studying how combat engineers can best provide the four primary engineer support functions: mobility, countermobility, survivability, and sustainment engineering. The school has proposed a redesigned force structure for the engineers based on its analysis of the future nonlinear battlefield, the projected balance of the four engineer support functions, and at what echelon of command the engineer support functions are expected to predominate.

This reorganized engineer force structure is the major concern of this paper. The posed research question is the following: Does the proposed combat engineer force structure for the ALBF corps adequately suit the anticipated environment on the nonlinear battlefield?

First, the monograph provides a discussion of the revised operational concept. A full appreciation of it is needed to determine how combat engineers can best support the corps commander's fight.

Second, the monograph defines the criteria used to evaluate the proposed engineer force structure and answer the research question.

Since the revised operational concept intends to retain the four tenets of AirLand Battle: agility, initiative, depth, and synchronization, the proposed engineer force structure must enable the Army to follow these tenets.(5) In addition, the words, 'adequately suit,' need further definition. They beg the question whether the proposed engineer force structure is feasible and practical.

Third, the monograph examines theory. Of the major military theorists, Clausewitz, Jomini, and Sun Tzu, the latter appreciates the nonlinear environment best. In addition, a well-known present day military theorist, Bill Lind, is a proponent of maneuver warfare which would predominate on the nonlinear battlefield.

After exploring theory, the monograph outlines engineer doctrine and structure and analyzes the proposed engineer structure against the criteria established earlier. Based on the analysis, conclusions and recommendations are derived.

II. AirLand Battle Future

The Army's proposed ALBF concept is an evolutionary advancement of warfare into the nonlinear environment. The future concept of fighting on the nonlinear battlefield is different from today's concept. Friendly and enemy combat forces deploy in widely dispersed formations and in great depth continually intermingling as battle ensues. As a result, fighting occurs in several directions and all around security becomes equally important. Nevertheless, some critics argue that the current concept, AirLand Battle, already accounts for nonlinear warfare. In fact, under the heading of nonlinear warfare, the Army's Field Manual 100-5, Operations, teaches that once battle is joined, forces will eventually intermingle on the battlefield.(6)

An example of this intermingling occurred in World War II during the 28th Infantry Division's operation in November 1944 at the battle of Schmidt and Kommerscheidt. The division formed its three regiments, the 109th, 112th, and the 110th, along a "line" of departure running from north to south along the Belgian-German frontier.(7) Once battle was joined, units of the 112th Infantry eventually intermingled with the counterattacking 116th Panzer Grenadier Division near Kommerscheidt creating confusion and loss of control.(8)

Although, it's true that AirLand Battle postulates the eventual intermingling of forces <u>once</u> battle is joined, ALBF starts the battle differently. It supposes an initial nonlinear configuration of forces <u>before</u> battle is joined.(9) This was not true with the 28th Division as mentioned above. This difference, whether the intermingling of opposing forces occurs before or after battle is joined, is just one of several between the two operational concepts.

As stated earlier, world political changes and American societal and governmental realities compel the Army to employ an operational concept that avoids grinding attritional warfare, yields to fiscal austerity by fielding a smaller army, and sustains fewer casualties. Given these conditions, linear warfare is unacceptable. A numerically-inferior force conducting war on a linear battlefield faces eventual extinction due to attrition. On the other hand, with the nonlinear battlefield, the Army finds an acceptable solution.

ALBF enables the Army to avoid needless casualties. First, it calls for attriting the enemy with firepower: artillery, attack helicopters, and close air support.(10) At the same time, ground maneuver forces remain safely out of range of enemy indirect weapon

systems prepared to move against enemy formations.(11) Then, only if firepower has not defeated the enemy formation, the revised operational concept recommends committing packages of combined arms brigades. Searching for enemy vulnerabilities, avoiding his strengths, and capitalizing on 'recon pull,' the maneuver brigades employ the indirect approach to complete the destruction of the heavily-attrited and isolated enemy ground maneuver forces in detail.(12)

Recon pull involves committing reconnaissance forces to locate enemy gaps, transmitting this intelligence to the decisionmaker, then, committing maneuver forces through the gaps. In other words, the reconnaissance forces pull the main body through confirmed enemy gaps. This method is opposed to command push where the commander develops a plan to commit the main force and supporting force in different areas of the unit's zone of attack, using a best guess of suspected enemy locations, without corroborating intelligence. Consequently, the commander pushes his forces into areas where he only suspects enemy vulnerabilities exist.(13) In conclusion, recon pull is one characteristic of ALBF that enables it to avoid attritional warfare.

This innovative ALBF concept compels the enemy to accept attritional warfare in order to range friendly ground maneuver forces. But, more importantly, the concept enables the majority of friendly forces to avoid attritional warfare. It generates great appeal and interest but also assumes the emergence of technology that does not yet exist in the Army inventory.

Technologists promise enormous changes to battlefield lethality. First, they expect to produce extremely sensitive electronic sensors

that greatly enhance target detection and acquisition.(14) Second, the development of very long range indirect fire systems promises highly accurate fires that can reach out to extended ranges. Finally, 'brilliant' weapon systems bring increased sophistication in capabilities. These new 'brilliant' weapons can discriminate among the various target types and judiciously select those targets whose destruction yields a greater advantage.(15) Without these technological developments, the ALBF concept fails. Only through profound technological advances can the Army attack the enemy and degrade his strength from a standoff distance without exposing ground maneuver forces likewise. However, some critics may question the expense incurred by table of organization and equipment (TO&E) changes and extensive research and development.

These critics may argue that the present force structure is already capable of fighting in both linear and nonlinear environments. Critics can easily demonstrate that situations can occur on the nonlinear battlefield where a commander may have to order a subordinate commander to employ the defense temporarily in a linear configuration. Assuming the present force structure is proven effective on today's linear battlefield, then it should obviously be effective in those instances where linear battle occurs within the nonlinear battlefield. I admit that this assertion is true. ALBF specifically envisions such combat. For instance, the corps commander may find it necessary to order a subordinate division to conduct linear operations to facilitate the corps' overall nonlinear fight.(16)

Second, critics may argue, as mentioned earlier, that the

eventual intermingling of forces turns the initially linear battlefield into a nonlinear battlefield, yet the present force structure is expected to be effective. Hence, critics may conclude that change and its associated expense is unnecessary. However, this assertion is false. Nonlinear operations demand a heightened level of physical agility by all forces in the battle area.(17) In addition, the greatly expanded depth of the battlefield exponentially increases the demand for greater physical agility. But the present force structure is not configured to provide the level of physical agility required to conduct nonlinear operations in the depth envisioned.

On the other hand, the proposed force structure is specifically designed with such agility in mind. The Army improved physical agility by eliminating everything that degrades mobility, thus enhancing each TO&E unit's physical agility. Furthermore, it is believed that a force structure designed to operate on the high-paced nonlinear battlefield can more easily respond to those few instances requiring linear battle, rather than vice versa.(18) This requirement for increased mobility derives directly from the nature of operations on a nonlinear battlefield. A review of the character of the nonlinear battlefield environment offers the necessary justification for the enhanced mobility requirement.

The greater need for mobility on the nonlinear battlefield is directly due to greater battlefield dispersion and American unwillingness to seek or accept attritional warfare. As mentioned earlier, the nonlinear battlefield expects much greater lethality and smaller armies. Together, these factors act to induce an expanded battlefield. Ground maneuver forces act to enhance the chances of

their survival. Thus, distances between friendly units increase tremendously. On the other hand, the need to move more quickly to concentrate forces at the decisive point and time, creating favorable combat power ratios and effecting the destruction of the enemy, increases exponentially due to lengthened battlefield distances. In addition, there still exists the danger of meeting engagements with unfavorable combat power ratios. Despite technologists' claims of near-perfect intelligence, the enemy can still appear unexpectedly whenever high technology communication or target detection and acquisition systems fail. If machines have taught anything since their appearance in the past 200 years, it is that they are not perfect. Breakdowns occur, and when they do, either rapid reinforcement from nearby friendly forces or the immediate breaking of contact with the stronger enemy force is required. The only solution to this problem is greatly increased battlefield mobility for ground maneuver forces. These forces require the ability to concentrate, disperse, and breach or bypass natural and man-made obstacles quickly.(19) Methods taken to increase mobility and physical agility could include shedding unnecessary weight from the force structure and fielding faster, more maneuverable combat vehicles and/or combat engineer mobility support vehicles. Implicit in the greater requirement for mobility is the ALBF emphasis on conduct of offensive warfare.

Inherent in this emphasis on offensive action, the commander avoids the defense as it implies a willingness to risk attrition warfare.(20) The offense on the nonlinear battlefield is characterized by the seizure and retention of the initiative, making

decisions without waiting for a superior's approval, and exquisite synchronization.(21) The longer distances and more diverse employment of the different arms requires the addition of the descriptor 'exquisite' to synchronization. The commander has a tough job employing all the means of war at the decisive time and place, leaving no element of combat power unused. Equally important to the characterization of offensive action on the nonlinear battlefield, there is a shift in favor of force-oriented instead of terrain-oriented objectives.(22)

ALBF strongly rejects terrain-oriented objectives for several reasons. Terrain-oriented objectives imply a willingness to switch over to the defense after seizing the objective in order to defend against counterattack. Seizing terrain merely because of the fleeting presence of the enemy can easily bog down into attrition warfare with all of the associated costs. Moreover, seizing a piece of terrain may only push the enemy force away without defeating it. In contrast, force-oriented objectives emphasize the offense. A friendly force attacks the enemy and then disperses and waits for the next opportunity to concentrate and attack. It is not fixated on any particular piece of terrain. Thus, it is less likely to defend and become bogged down in a battle of attrition. In addition to the change in battlefield tactics, a shift in responsibilities among the various battlefield echelons occurs.

The corps asserts a greater role influencing battlefield activities more than ever before. As the chief tactical echelon controlling the ALBF fight, it orchestrates the battle, synchronizing and integrating combined arms brigade-sized packages.(23) The corps

attaches and detaches them among different divisions to reduce its span of control.(24) In addition, the corps assumes many of the administrative and logistical functions formerly held by division and directly interacts with the maneuver brigades in these two areas.(25)

The division loses its past predominance and becomes chiefly a tactical headquarters. The division retains only the logistics necessary to support the few elements located at division level. Those elements remaining include the headquarters company, band, military police company, and small headquarters detachments that control the close support artillery and forward support battalions.(26) Excluding the administrative and logistical support duties that the corps assumes, the maneuver brigade assumes the remainder.(27)

The divisional maneuver brigade becomes the lowest level headquarters that controls both tactical and logistical functions.(28) This headquarters synchronizes and integrates the battlefield operating systems by task organizing single-arms pure battalions. The brigade possesses an organic engineer battalion, 'close support' artillery and forward support battalions. These units remain with the maneuver brigade no matter where it goes, or to which division headquarters the brigade is temporarily attached.(29)

The battlefield framework changes dramatically with the corps controlling three major areas as depicted in figure one on page A-1. These areas include the detection area, the battle area, and the tactical support area. The detection area extends up to 400 kilometers from the tactical support area. Enclosed within the detection area, the battle area extends out to 200 kilometers from the

tactical support area. The corps establishes these three areas such that the tactical support area remains out of enemy indirect fire range.(30) As friendly forces grapple with enemy forces in the forward two areas and logistical units located in the tactical support area push supplies forward to sustain combat power, a distinct cycling of the battle becomes evident.(31)

The Army's concept of ALBF expects friendly forces to repeatedly concentrate and disperse on the future battlefield as they continuously cycle through four overlapping stages. These four stages include detection, fires, maneuver, and recovery.(32)

As opposing forces approach each other, the corps commander uses sensors in the furthest regions of the detection area to detect enemy forces and determine their strength, disposition, and direction.(33) Then, he uses an air and ground reconnaissance task force in the battle area to verify sensor reports. The reconnaissance forces are composed of armored cavalry regiments, corps aviation brigades, long range surveillance units, light infantry, and engineers.(34)

As the enemy enters the battle area, the corps commander commits his first weapons of choice. He engages enemy forces with airpower and long range ground indirect fires, heavily attriting and isolating the enemy, making his formations more accessible to attack by friendly maneuver forces.(35) ALBF no longer simply relegates corps artillery to its traditional counterfire or reinforcing role. Indeed, corps artillery is no longer a maneuver supporting arm. A good historical example of the fires stage is the typical battle of World War I on the western front, in which the commander attempted to destroy the enemy principally with artillery fires before committing the infantry.(36)

Thus, the corps commander uses artillery as the primary combat arm during the fires stage to conduct the principal attrition of the enemy before committing ground maneuver forces.(37) During the fires stage, the corps commander husbands the maneuver forces out of enemy long range indirect fire range in the tactical support area until they are committed during the next stage.(38)

During the maneuver stage, the corps commander commits the maneuver forces, only if required. These forces deploy from the tactical support area into the battle area to complete the destruction of enemy forces. As mentioned earlier, ground maneuver forces cycle through concentration and dispersion. They concentrate to complete the destruction of heavily-attrited enemy formations, and then quickly disperse. The key to survivability and successful maneuver to positions of advantage from which to engage/destroy the enemy on the nonlinear battlefield is rapid mobility.(39) When the corps determines that the enemy has run out of further reinforcements, the next stage begins in earnest.

As the battle ends, the recovery stage dominates. Maneuver and artillery brigades depend heavily on corps logistics on the nonlinear battlefield. These restructured units travel extremely light in order to maximize their mobility. To simplify logistical support, corps emphasizes unit distribution rather than supply point distribution. Furthermore, the removal of logistical units from division level actually causes the corps to adopt throughput distribution, direct delivery of supplies and repair parts from corps to brigade support areas. In this manner, the corps quickly resupplies the combined arms brigades for the next cycle of battle. This concludes an overview of

ALBF in some detail from the maneuver commander's and logistical supporter's points of view. Now, I will briefly address how ALBF impacts on combat engineer battlefield activities.

As stated earlier, static defense in ALBF plays a smaller role. As some engineer functions apply more to the defense and some apply primarily to the offense, the present balance of the engineer support functions shifts under ALBF. In other words, some battlefield activities that predominate under today's concept may no longer do so. The predominance of offensive warfare on the nonlinear battlefield suggests that mobility support functions so integrally related to the offense will take precedence. In contrast, ALBF relegates countermobility and survivability functions to lesser roles. With these assumptions in mind, the Engineer School is redesigning an engineer force structure that accentuates mobility and still retains sufficient capability that can accommodate the need for some countermobility and survivability support.

III. CRITERIA

Selection of criteria to evaluate, compare, and assess the proposed engineer force structure with the revised operational concept and the existing engineer force structure is extremely critical to the validity and acceptance of this analysis. Thus, it is imperative to select criteria that are widely recognized. In addition, it is important to select criteria that reflect the present political, economic, and technological realities since these factors will profoundly impact upon the eventual realization of any recommended changes.

The search for criteria often leads back to the foundation on

which the concept was developed. In this case, the foundation of ALBF is AirLand Battle. Since the ALBF concept assumes that the tenets of AirLand Battle remain unchanged, these tenets (agility, initiative, depth, and synchronization) form excellent criteria. If the proposed engineer force structure does not support them, then the proposed engineer structure cannot enable the Army's force structure as a whole to adhere fully to the four tenets.

The nonlinear battlefield amplifies the importance of these four tenets. In fact, it adds new meaning to them. Rapid movement of combined arms brigades around the ALBF battlefield demands forces that are physically able to move quickly. Under AirLand Battle, this tenet usually emphasized more of a cybernetic meaning. While cybernetic agility remains terribly important, it is by itself insufficient for ALBF. Nonlinear operations stress the physical meaning more than ever. Next, on a battlefield measured in great depth, where demanding physical and mental agility are required, operations require that the commander has the freedom of action to seize the initiative and exploit opportunities. Indeed, the commander unable to operate in this fashion will not remain in command for very long. Finally, fighting with numerically inferior forces means accepting greater risk. Therefore, the commander must demonstrate a profound ability to synchronize all battlefield operating systems exquisitely to avoid a bold risk becoming rash. In conclusion, the four tenets of ALBF provide a basis for criteria, but they do not necessarily treat the political, economic, and technological realities.

Two criteria that reflect those realities are practicality and feasibility. Practicality begs an answer to the question whether the

change is capable of serving a useful purpose and whether it is appropriate to do. Feasibility addresses the question whether the change, new equipment or organizational, is capable of being accomplished in terms of cost and technology. In other words, can it muster enough votes to receive Congressional approval and can it work on the battlefield? Thus, the engineer force structure must adhere to practicality and feasibility. These factors will exert enormous influence on new equipment acquisition or structural reorganization. A convincing, even an overwhelming, argument is an absolute requirement.

IV. THEORY

As expected, the Army's revised operational concept is not founded on any new principles of warfare. In fact, it reflects many of the prescriptives that the well-known Chinese, Sun Tzu, wrote down for posterity over two thousand years ago in his book The Art of War. For example, he emphatically warned his readers to avoid grinding attritional battle.

> When the army engages in protracted
> campaigns the resources of the state
> will not suffice.
> For there has never been a protracted
> war from which a country has benefited.(40)

Instead, the great theorist implores his readers to seize the initiative and assume the offensive to destroy the enemy with fires by maneuver, exactly what ALBF teaches.(41)

Sun Tzu also taught his students of war to avoid the enemy's strengths and strike at vulnerabilities, in other words the indirect approach. He also emphasized the need to exploit intelligence to provide greater battlefield certainty and to be willing to provide

greater freedom of action to subordinates.(42) In addition, he taught that the commander should force the enemy to prepare everywhere and thus be weak everywhere, creating a greater number of vulnerabilities.

> For if he does not know where I intend to give battle he must prepare in a great many places. And when he prepares in a great many places, those I have to fight in any one place will be few.(43)

Advocating many of the same ideas as Sun Tzu, a more recent military theorist, Bill Lind, strongly opposes attritional warfare. He writes that the purpose of maneuver is to gain positional advantage over the enemy and ultimately defeat him through the disruption of his cohesion, not attrition.(44) Like Sun Tzu, he encourages attacking the enemy's vulnerabilities not his strengths.(45) Lind's writings soundly re-echo Sun Tzu's teachings on which the Army's ALBF concept is well founded.

V. COMBAT ENGINEER DOCTRINE

The nonlinear battlefield radically affects the balance of engineer support functions. As noted earlier, these functions include mobility, countermobility, survivability, and sustainment engineering. Of all four functions, ALBF envisions mobility and sustainment engineering assuming greater importance.(46) Included under the category of mobility falls a significant, though often overlooked, engineer activity called mobility reconnaissance.(47)

The commander expects more responsive mobility reconnaissance to be imperative to mission accomplishment on the nonlinear battlefield as compared to the linear battlefield. Vitally important to frequently displacing and rapidly maneuvering forces, the engineers gather and provide detailed, technical knowledge of road and trail

conditions including, for example, expert bridge classification.(48) Beneficiaries of mobility reconnaissance include the corps' reconnaissance task force during the detection stage, field artillery brigades during the fires stage, maneuver brigades during the maneuver stage, and logisticians during the recovery stage.

If trafficability conditions are inadequate and bypasses are unavailable, it is critical that engineers rapidly provide mobility support. This support enables field artillery brigades to displace quickly, keeping the enemy forces within indirect artillery range but remaining out of enemy direct fire range. During the maneuver stage, engineer mobility support enables the combined arms brigade to reach its objective and complete the destruction of the enemy.

Another engineer function taking a leading role, related to mobility support, is sustainment engineering. It includes among others, maintenance of main supply routes.(49) But on the nonlinear battlefield, especially extending out to the brigade forward support battalions in the battle area, main supply routes are seldom permanent. The corps logistician expects the engineer to enable transportation units to travel from corps logistical unit locations to maneuver brigade positions delivering repair parts, ammunition or bulk fuel.(50) Constantly changing unit locations means that routes change daily. Thus, the engineer cannot focus on keeping any particular route open; rather, he concentrates on enabling the transporter to reach his delivery destination. If the engineer cannot concentrate his efforts on any particular route serving as a main supply route, then the amount of sustainment engineering increases exponentially in order to meet the extra demand caused by the numerous logistical

routes.

The three engineer support functions, discussed above in detail, deal with enabling maneuver or movement, activities associated more often with the tactical offensive than with the tactical defensive. If the engineer places greater priority on these three functions, then it seems obvious that he pays less attention to the remaining two, countermobility and survivability.

The ALBF concept of a smaller Army on a larger battlefield, (in other words, greater battlefield dispersion) significantly diminishes the amount of countermobility effort expended. Engineer forces are less likely to construct extensive obstacle systems or impregnable linear defensive lines across a much larger corps width and depth to shape the battlefield.(51) There are just not enough engineers to construct them and there are not enough maneuver forces to man them. However, engineer-provided countermobility support certainly does not disappear from the nonlinear battlefield. As stated earlier, there are occasions on the nonlinear battlefield where the corps commander directs a subordinate unit to fight a linear action in order to enable the corps as a whole to continue prosecuting an overall nonlinear fight.(52) In addition, though not engineer-provided countermobility, the capability to employ air/artillery-delivered scatterable mines continues to give the maneuver commander a quick means of shaping the battlefield.

The remaining engineer support function, survivability, also diminishes in importance as ALBF envisions fewer dug-in fighting positions.(53) First, the corps intends to husband forces in the tactical support area for as long as possible, outside of the range of

the majority of enemy indirect fires.(54) Thus, it makes little sense to expend immense time and resources for the construction of survivability positions for combat forces when they are located in the tactical support area where survivability positions are not needed. Second, once deployed in the battle area within range of enemy indirect fires, tactics on the nonlinear battlefield (the avoidance of the tactical defense and its associated attrition) cause friendly units to capitalize on frequent displacements and rapid movement (occurring as a result of nonlinear operations) for protection in lieu of numerous dug-in fighting positions. In addition, the future's promise of 'brilliant' target detection and acquisition capabilities using top attack weapon systems suggests that construction of survivability positions without significant overhead cover serves little purpose in the battle area. Furthermore, the construction of fighting positions with survivable overhead cover is impractical.

In summary, the nonlinear battlefield predicts increased use of mobility reconnaissance, mobility support, and sustainment engineering and decreased use of countermobility and survivability. Next, a detailed examination at each of the individual unit structures discloses the numerous changes in engineer tables of organization and equipment (TO&E).

VI. COMBAT ENGINEER STRUCTURE

The restructured engineer TO&E's on the nonlinear battlefield change significantly at each echelon. The maneuver brigade assumes permanent control of a combat engineer battalion, hereafter described in this monograph as the maneuver brigade engineer battalion. The corps organizes all remaining combat engineers into corps mechanized

and wheeled combat engineer battalions specifically designed to function in different locations on the battlefield, the mechanized engineers primarily in the battle area and the wheeled engineers primarily in the tactical support area. In addition, the corps consolidates all assault float bridging assets in the corps engineer brigade.(55) Thus, the divisional echelon is left without any engineers except an engineer planning and operations cell in the division G-3 section.(56) Of these changes, removing the combat engineer battalion from the division and assigning it to the maneuver brigade constitutes the greatest change.

A mechanized combat engineer battalion dedicates its support to a maneuver brigade on a permanent basis. Furthermore, each of the three combat engineer companies habitually supports a maneuver task force. Organizationally, the maneuver brigade engineer battalion's combat engineer company consists of two combat engineer platoons and one obstacle section. Within each combat engineer platoon, there are three combat engineer squads and one assault section. The engineer company's structure and major end items of equipment are shown in figure two on page A-2.

By assigning mechanized combat engineer battalions to maneuver brigades, the Army decentralizes engineer support, primarily mobility support. During offensive operations, these assets become crucial to mission accomplishment. The maneuver brigade engineer battalion primarily employs mobility support vehicles along the brigade's route from the tactical assembly area to the objective.(57) In contrast, on the linear battlefield, mobility operations occur often within direct fire range of some objective, for example, an enemy battle position

overlying some key terrain feature.

Under the new TO&E, the assault section is responsible for providing greatly increased mobility support. Each section includes one combat engineer vehicle (CEV), two armored vehicle launched bridges (AVLB's) and two mineclearing line charges (MICLIC's). As a result, the maneuver brigade possesses two assault breaching sections per maneuver task force, satisfying the doctrinally required number of breaching sections.(58) This more than doubles the number of assault breaching CEV's and AVLB's in the division. When the Engineer School finishes publishing the Basis of Issue Priority (BOIP) for the proposed combat mobility vehicle (CMV), heavy assault bridge (HAB), and the MICLIC, each assault section will have two each.(59) In addition to the changes in the combat engineer company, there is a valuable improvement in the maneuver brigade engineer battalion.

At battalion headquarters, the operations section includes a dedicated reconnaissance section with a High Mobility Multi-Purpose Wheeled Vehicle (HMMWV).(60) This section provides the ability to conduct engineer route reconnaissance with soldiers specifically authorized for that purpose. They can operate independently or upgrade the maneuver brigade's scout platoon with expert engineer reconnaissance capability. It is important to note that the assigned vehicle, the HMMWV, is the same vehicle that future scout platoons will use in lieu of their currently assigned Bradley Cavalry Vehicle.(61)

Since ALBF expects only occasional instances of linear defensive warfare, the maneuver brigade engineer battalion loses the majority of its countermobility and survivability support vehicles to the corps

engineer brigade, where they are consolidated. The more agile armored combat earthmovers (ACE) replace the slow moving dozer and bucketloader hauled by road-bound light equipment tractors and low bed trailers. In addition, the battalion loses the small equipment excavator (SEE). Although it is a four wheel drive vehicle, it provides little armored protection, prefers roads over cross country, and thus, cannot achieve sufficient cross country speed to keep pace with tanks and infantry fighting vehicles. Consequently, the maneuver brigade engineer battalion is better able to keep pace with its supported maneuver brigade.

The only rapid countermobility vehicle that the battalion retains is the track mounted, scatterable minelaying Volcano, which begins fielding this year.(62) It can quickly emplace minefields where enemy avenues of approach intersect the supported maneuver brigade's flanks, always an important consideration during offensive operations. Should the maneuver brigade engineer battalion require additional countermobility and survivability support, the consolidated assets in the corps mechanized and wheeled combat engineer battalions can quickly move into the battle area and augment the maneuver brigade engineer battalion.

Almost identical to the maneuver brigade engineer battalion, the engineer company, corps mechanized combat engineer battalion is shown in figure three on page A-3. Equipped with tracked engineer squad vehicles, this battalion enables the corps commander to commit survivable corps engineer assets to support nondivisional activities conducted in the forward portion of the battle area without drawing engineer assets from the maneuver brigades.(63) Nondivisional units

include the corps' reconnaissance task force, the corps artillery brigades, and corps transportation companies. Furthermore, the corps mechanized combat engineer battalion possesses CEV's and AVLB's, although less than the maneuver brigade engineer battalion.(64) These assets enable the corps mechanized combat engineer battalion to provide substantial mobility support to the corps' reconnaissance task force and the corps field artillery brigades.(65) The corps mechanized engineer battalion also includes countermobility support vehicles, for example, ACE's and SEE's, to shape the battlefield in support of the corps commander's plan.(66) In summary, the corps mechanized combat engineer battalion possesses armored protection to work anywhere in the corps' battle area and armored mobility assets to provide mobility support within range of direct and indirect fires.

A cousin of the corps mechanized battalion is the corps wheeled combat engineer battalion. Its engineer company, depicted in figure four on page A-4, contains much of the same equipment as the corps mechanized engineer company. Corps wheeled engineers dispense with CEV's and AVLB's as they do not provide mobility support to heavy forces in the forward portion of the battle area as do corps mechanized engineers. On the other hand, the corps wheeled combat engineer battalion provides mobility support to the maneuver brigade from the tactical support area to the tactical assembly areas to save unnecessary wear and tear on the maneuver brigade engineer battalion's vehicles. In addition, the corps wheeled combat engineer battalion provides survivability, countermobility, and sustainment engineering in the tactical support area and in the extreme rear of the battle area.(67) Thus, the battalion retains its SEE's and bulldozers. They

add an extra dimension in sustainment engineering which is lacking in the corps and maneuver brigade mechanized engineer battalions.(68) For example, they help transportation units expedite the movement of supplies using accelerated throughput distribution.(69) In addition to the changes in the combat engineer battalions in the corps engineer brigade, the assault float bridge companies also undergo change.

Eliminating the assault float bridge company out of the heavy division, the ALBF concept places the bridging assets under corps control.(70) No real reorganization of the bridge company is expected. It only expands from 144 meters of bridge to the corps assault float bridge company standard of 212 meters of bridge. This concludes the major revisions occurring in the doctrine and structure of the combat engineer units. Now, I will compare and assess these changes to determine if they are suitable to support the AirLand Battle Future's concept on the nonlinear battlefield.

VII. CRITERIA ANALYSIS

To begin this analysis, I will examine agility. Foremost of the improvements in physical agility in the maneuver brigade engineer battalion's support to the heavy division is the significant increase in the number of mobility support vehicles. The total number of mobility support vehicles significantly increases from 8 CEV's, 16 AVLB's, and 16 MICLIC's in the AirLand Battle heavy division to 18 CEV's, 36 AVLB's, and 36 MICLIC's in the ALBF heavy division. Furthermore, with the projected fielding of the CMV and HAB (the replacements for the CEV and AVLB), the division's mobility capability significantly improves if they are powered by much stronger turbine engines and ride on modernized suspension systems, like those built

into the Abrams tank. These new generations of engineer mobility support vehicles could deliver much greater mobility support than their predecessors. Moreover, with the fielding of the CMV's, their number in the division doubles from that of the CEV's from 18 to 36.(71) In summary, each division would eventually carry 36 each of CMV's, HAB's, and MICLIC's.

As mentioned earlier, this increase in mobility support vehicles allows for a redundancy in CMV's in the assault breaching section at the breaching site, providing insurance that the breaching attempt succeeds. The enemy deliberately searches for the attractive signature of engineer breaching vehicles. Their low density on the battlefield causes the enemy to emphasize their destruction and stop the breach by destroying one critical mobility vehicle rather than several fighting vehicles. With two CMV's, the assault breaching section stands a much better chance of breaching the enemy obstacle, should the enemy destroy or disable the first CMV. Moreover, given a complex enemy obstacle, for example, two abatis or wire obstacles in depth, the assault breaching section can leapfrog CMV's maintaining the maneuver task force's momentum. In conclusion, the maneuver units are much more agile due to this tremendous boost in the number and quality of engineer mobility vehicles.

Another important feature is that the engineer assault section forms a permanent part of the combat engineer platoon.(72) As a result, the platoon is no longer required to coordinate for an assault breaching section to be attached for an offensive movement. This permanent relationship enables training on a more frequent basis and builds a more cohesive unit. This relationship is much preferred to

an ad hoc organization in which units train together infrequently and form on the battlefield just prior to performing their mission. Not only is the engineer platoon streamlined for better mobility support, but so is the engineer company.

The engineer company in the maneuver brigade engineer battalion sheds unnecessary soldiers, equipment, and vehicles that degrade its ability to keep up with the maneuver forces. As mentioned earlier, the engineer company loses the SEE and the bucketloader and retains only a minimum of countermobility support, a rapid minelayer. The Volcano, mounted in an M548, tracked carrier is being fielded this fiscal year. It is important to recognize that the TO&E separates Volcano in the obstacle section from the engineer platoons.(73) The platoons primarily provide mobility support while Volcano strictly provides countermobility support. Thus, the company commander retains command and control of the obstacle section employing it along the maneuver task force's flanks. This enables the combat engineer platoon leader to focus his attention on his mobility mission in support of an advancing maneuver company team. In addition to the engineer company, the engineer battalion's headquarters is also streamlined for improved battlefield mobility.

The battalion's streamlined TO&E of 368 soldiers ensures an engineer force more mobile than its predecessors.(74) In contrast, the current divisional engineer battalion has 901 soldiers, while its counterpart, the corps mechanized engineer battalion totals 814 soldiers.

The battalion headquarters company absorbs some of the support assets deleted from the engineer companies, for example maintenance

and mess functions.(75) More important, as mentioned earlier, the engineer battalion's dedicated engineer reconnaissance team adds expert engineer data gathering capability to the maneuver brigade scout section where no dedicated ability existed before. Besides the above improvements in physical agility, the engineer battalion also improves the maneuver brigade's cybernetic agility.

The engineer battalion brings with it a battalion commander, normally with an average of 18 years of solid experience and sound judgment, and a full battalion staff. This is a change from AirLand Battle's maneuver brigade engineer who is usually a recent advanced course graduate captain without any company command experience.

The permanent command relationship between a maneuver brigade and its engineer battalion enhances the brigade's agility. Under AirLand Battle, the relationship between maneuver forces, at brigade and below, and combat engineers was typically a direct support relationship. This relationship is purely a support relationship. No command authority exists that empowers the maneuver brigade commander to task organize engineers in direct support. To illustrate, a maneuver brigade commander with an engineer battalion placed in direct support to his brigade has no authority to place any subordinate element of that engineer battalion attached or opcon to or in direct support of any of the maneuver brigade subordinate task forces.

However, ALBF assigns a combat engineer battalion to the maneuver brigade. Thus, a command relationship exists that empowers the brigade commander to task organize. Precious time is never wasted requesting division to change command and support relationships. This closer relationship between maneuver forces and supporting engineers

becomes extremely important since ALBF expects offensive operations to predominate on the battlefield. Offensive operations demand that maneuver forces respond more quickly to enemy obstacles to maintain the momentum of the attack. The presence of a command relationship enables quicker response times to a commander's decisions and the movement of the combined arms forces on the battlefield. In conclusion, the maneuver brigade engineer battalion significantly improves the agility, both physical and cybernetic, of the maneuver brigade.

The corps mechanized combat engineer battalion enjoys the addition of the same armored vehicle mobility support that the maneuver brigade engineer battalions possess.(76) Now, for the first time, the corps commander can augment the armored cavalry regiment (ACR) and its lone combat engineer company with additional CEV's and AVLB's in the corps mechanized engineer battalion, without tapping divisional assets. Moreover, the Army eventually will issue the more capable CMV and HAB to the corps mechanized engineer battalion. During the ALBF fires stage, the corps can dedicate mobility support to the shoot and move corps artillery brigades in the battle area behind the corps reconnaissance task force. Not only does the redesigned corps mechanized engineer battalion add mobility support vehicles, its TO&E is reduced in order to become a more physically agile unit.

The restructured corps mechanized combat engineer battalion is not weighed down with equipment designed to support the entire battlefield in the tactical support and battle areas as is the current corps mechanized engineer battalion. Since the restructured

battalion's principal purpose is engineer support in the battle area, its TO&E strips out unnecessary equipment, such as bulldozers, bucketloaders, light equipment transporters, cranes, graders, air compressors, and low bed trailers.(77) Thus, it can more easily keep up with the fast moving ACR and other forces. Without a doubt, the redesigned corps mechanized combat engineer battalion is extremely agile providing the corps with a flexible and responsive mechanized combat engineer force.

The corps wheeled combat engineer battalion also improves the corps' physical agility in two ways, as mentioned earlier. First, to conserve the combat strength of the maneuver brigade engineer battalions, the corps wheeled combat engineer battalion can provide mobility support to maneuver brigades moving from the tactical support area to their tactical assembly areas located in the extreme rear of the battle area. Second, the corps wheeled engineer battalion indirectly provides agility to the corps' forces deployed in the battle area by assisting logisticians in the continued flow of logistics.

The above discussion shows how the corps mechanized and wheeled combat engineer battalions perform differently providing mobility support to increase the corps' agility in the conduct of nonlinear operations. The two different types of corps engineer battalions can also perform identical functions in the battle area. They can provide countermobility support in the battle area to shape the battlefield. For example, as mentioned earlier, the corps commander may need a subordinate division to conduct linear operations in order for him to continue nonlinear operations overall. Since corps engineer units

provide the majority of countermobility support within the corps, the corps commander would have to reinforce the division conducting linear operations with corps engineers. The redesigned engineer force structure reduces unnecessary equipment from the maneuver brigades during the majority of operations when the offense predominates and the redesigned engineer force structure can quickly reinforce the maneuver brigades with countermobility support when needed on those rare occasions. Without a doubt, the three different combat engineer battalions offer great improvements in agility. The consolidation of assault float bridging at corps level does likewise.

This monograph asserts that the corps accrues greater agility from consolidating its bridging at corps rather than leaving it dispersed throughout corps and its subordinate divisions. Admittedly, the divisions lose some agility through the loss of direct control of organic assault float bridging. The division can no longer effect a river crossing without coordinating with corps for bridging assets. On the other hand, the elimination of the constant presence of the bridge company and its 40 odd five ton wheeled bridge trucks improves the division's physical agility. In addition, projecting river crossing operations in future plans is much easier than planning countermobility operations for enemy manufactured obstacle belts. Terrain, which remains rather constant, determines whether a river crossing operation is required. Unlike river obstacles, man-made obstacles can be created in a very short time. Thus, the higher level planner has a solid grasp on the projected need for bridging assets and has more time to shift them from corps to a division when it is given a river crossing task as opposed to breaching operations against

obstacle belts. Furthermore, pooling assets in the tactical support area behind the battle area enables the corps commander to keep them out of range of enemy indirect fires and concentrate them rapidly under the corps engineer's control on the battlefield without having to detach and reallocate bridging assets between various divisions. In conclusion, the overall effect of restructuring the engineer forces under ALBF definitely benefits agility, both physical and mental. This vast improvement in agility also offers a healthy side benefit in initiative, the next criterion for discussion.

The nonlinear battlefield promises a menu of fleeting opportunities to seize the initiative. However, maneuver commanders are all too frequently unable to capitalize on them. As shown above, the three combat engineer battalions' vastly improved mobility support capabilities enable commanders at all tactical levels to respond quickly and take advantage of those fleeting opportunities. Moreover, the presence of an engineer battalion commander with a full staff provides more maturity and judgment. The engineer battalion commander intuitively knows sooner when to seize the initiative as opposed to less mature engineer company commanders under the present concept. In addition, the innovative concept of directing highly agile corps mechanized engineers to provide mobility support to corps artillery brigades during the fires stage enables the corps commander to shape the battlefield with scatterable minefields or destroy targets as they are acquired without pushing large numbers of maneuver forces forward and exposing them to enemy indirect fires. Thus, the corps commander can quickly seize the initiative when an opportunity arises. Furthermore, the fact that the corps engineer can quickly employ the

mechanized and wheeled combat engineer battalions to shape the battlefield under corps control enables the corps commander to wrest the initiative away from the enemy. Admittedly, pooling assault float bridging assets at corps level does hinder a lower level commander from suddenly seizing those rare opportunities to cross a river, not planned for in the corps plan. Rather, he must wait for corps to move bridging assets forward limiting his opportunities of seizing the initiative. Overall, however, the engineer structure definitely improves the opportunity for the nonlinear battlefield commander to seize the initiative.

Next, I will address depth. The proposed engineer force structure adds tremendous engineer depth to the battlefield. Maneuver brigade engineers provide a larger amount of engineer support to each maneuver brigade. No longer must a reserve brigade wait for the committed brigades to release their engineers before it can be committed to execute a mission. (Doctrinally, engineers should not be held in reserve.)(78) By withholding some mechanized engineer battalions from the division in the form of corps mechanized combat engineer battalions, the corps retains sufficient depth. The streamlined corps mechanized engineer battalions develop combat power to support all combat units principally in the battle area. Further to the rear, the corps wheeled engineer battalions operate in the tactical support area to develop combat power as needed in the extreme rear of the battle area. As a result, the corps has engineers posted in the extreme front of the battle area with the reconnaissance task forces, in the center of the battle area with the artillery brigades and the maneuver brigades, and in the rear of the battle area and

tactical support area to shape the battlefield and maintain the flow of logistics. Not only do the engineers provide depth in terms of battlefield space, they also provide depth in terms of planning and command and control.

Under AirLand Battle, the engineer structure provides only a brigade engineer captain or major at maneuver brigade headquarters and an engineer planning and operations cell at division G-3. Little capability exists in depth to command and control both the divisional engineer battalion and additional corps engineer assets committed to the division. Likewise, the divisional engineer company commander supporting the brigade and the brigade engineer plans officer are ill suited to command and control additional corps engineer assets given to a maneuver brigade. In contrast, under ALBF, the corps enjoys superb improvement in depth of engineer planning and command and control with an engineer battalion staff with each maneuver brigade and an engineer planning and operations cell in division G-3. Should corps commit more engineer assets to the division, its engineer planning and operations cell, headed by a colonel, is capable of planning for engineer operations in support of the division.(79) In addition, the maneuver brigade engineer battalion commander and his staff are fully capable of commanding and controlling additional corps engineer companies attached to the maneuver brigade.

Applying the criterion of depth against the consolidation of all assault float bridging assets causes a decrease in depth. Their removal from divisional control means the absence of bridging in the battle area unless the corps plan warrants their forward presence. Thus, the absence of bridging forward of the tactical support area

obviously means a reduction in depth. However, as mentioned above, heightened certainty of river crossing operations should alert planners to the need of bridging in sufficient time to ensure its timely presence on the battlefield. Thus, I believe that a reduction of depth due to pooling bridging assets at corps is alleviated by the greater certainty of river crossing operations and more than paid for by the increase in agility and initiative.

Next, I will discuss synchronization. As mentioned earlier, the permanent command relationship betweer the maneuver brigade and its engineer battalion enhances agility on the battlefield. Similarly, permanent command relationships enhance the brigade's synchronization. The absence of support relationships means not waiting for division to approve changes in the task organization. Thus, the brigade is better able to orchestrate the arrival of combat forces and to project combat power at the decisive time and place. Furthermore, the presence of sufficient mobility support vehicles in each maneuver brigade permits the speedier commitment of maneuver brigades without waiting for reallocated supporting engineers to catch up. As a result, the corps commander can attach and detach maneuver brigades between different heavy divisions without additional considerations about task organization. Like their maneuver brigade counterpart, the corps mechanized and wheeled combat engineer battalions enhance battlefield synchronization.

Although the Army disperses engineer assets, in particular mobility support assets, to maneuver brigades, it retains sufficient mechanized and wheeled engineers at corps level to be able to influence the battle at the decisive time and place. This capability

is important on the nonlinear battlefield with its extensive distances. In particular, the addition of armored mobility support vehicles to the corps mechanized engineer battalions enables the corps to influence the battle at the decisive time and place in the battle area, for example, the reconnaissance task force during the detection stage and the shoot and move artillery brigades during the fires stage.

One often forgotten aspect of synchronization is economy of force. The separation of corps combat engineer assets into corps mechanized and wheeled engineer battalions enables the corps commander to economize better his engineer forces. He can devote use of corps engineers to the decisive time and place and minimize engineer presence on the battlefield where combat power is less important. In addition, the separation of corps combat engineer assets into corps mechanized and wheeled engineer battalions enables the corps commander to economize his engineer forces. For example, he can allocate the greater combat power of the mechanized engineers equipped with their armored mobility support vehicles to the decisive time and place while distributing wheeled engineers to battlefield activities not requiring extensive armored protection. Combining the strengths and weaknesses of these two types of corps engineer battalions, the corps commander is better able to economize his scarce armored engineer assets. Thus, he can better influence the battle at the decisive time and place.

Consolidating all assault float bridge assets under corps control enables speedier battlefield synchronization. First, as mentioned earlier, the corps commander, who orchestrates the battle, knows when assault float bridging assets are needed in advance. Capitalizing on

his advanced knowledge, he can quickly shift those assets from the tactical support area to the decisive place and time employing economy of bridging assets elsewhere.

Next, the monograph addresses the criteria that define the words 'adequately suitable.' I will begin with feasibility. First, the downsizing of the Army scheduled for the near future enables the Army to make structural changes more easily. Funds will be available to move soldiers, their families, and units in any case in order to downsize the Army. Thus, implementing the ALBF concept can occur simultaneously without incurring additional costs and requesting them from the Congress. Second, the impending reduction of some heavy divisions frees CEV's, AVLB's, and MICLIC's to backfill the shortages created by the implementation of this concept. Thus, the Army can field the remaining maneuver brigade engineer battalions and corps mechanized engineer battalions with sufficient mobility assets as required by ALBF. Third, there appear to be sufficient active component engineer battalions that enable the Army to convert some of the corps wheeled engineer battalions to maneuver brigade engineer battalions and avoid demands for additional soldiers.(80)

There is a caveat that argues against feasibility. The lack of fully modernized engineer mobility vehicles calls into question the feasibility of the proposed engineer force structure. The CEV and the AVLB are continually plagued with maintenance breakdowns due to their extreme age. In addition, these two vehicles are saddled with an outdated suspension system, chassis, and power plant when compared with new generation armored vehicles. This shortfall prevents the maneuver forces from fully capitalizing on the tremendous mobility of

their Abrams tanks and Bradley fighting vehicles. However, once the Army fields the next generation of engineer mobility vehicles (for example the CMV and the HAB), the proposed engineer force structure will empower ALBF with the mobility needed to maximize the maneuver force's potential on the nonlinear battlefield. The reader should not misconstrue this qualification. Whether organized with CEV's and AVLB's or CMV's and HAB's, the proposed ALBF engineer force structure is definitely superior to the present AirLand Battle engineer force structure.

Next, the proposal to consolidate assault float bridging assets at corps is definitely feasible. The divisional bridge company is almost identical to the corps ribbon bridge company except for fewer bridge bays. With the deactivation of several heavy divisions, this enables the Army to use the freed divisional bridge companies to plus up others to the corps bridge company standard of 212 meters.

Now, I will address the last criterion, practicality, starting with the maneuver brigade engineer battalion. The enormous increase in mobility assets is sufficient reason alone to support this TO&E over the present AirLand Battle engineer force structure. Since maneuver brigades are expected to operate beyond mutually supporting distance with one another, the redesigned engineer TO&E is extremely practical doubling the number of mobility support vehicles in the heavy division to provide a greater degree of independence in this area. In addition, the presence of an engineer battalion commander and staff at maneuver brigade level is highly practical. Should the brigade receive corps slice mechanized engineer support to conduct a linear battlefield defense or a corps assault float bridge company to

conduct a river crossing, the maneuver brigade's engineer battalion commander and staff can plan the use of and command and control the additional engineer assets. AirLand Battle Future's willingness to commit maneuver brigades on their own out of supporting range of other divisional maneuver brigades places a premium on a stand alone engineer planning capability. Thus, I believe that the maneuver brigade engineer battalion is practical; in other words, it is useful.

The corps mechanized engineer battalion is very practical. Not only can it provide the demanding mobility functions required on the nonlinear battlefield, it can also provide countermobility support to the corps' reconnaissance task force. In addition, as mentioned earlier, the corps commander must occasionally direct a subordinate division to fight a linear battle. In this case, the corps would reinforce a division with corps mechanized engineer battalions to shape the battlefield. Of course, the corps commander continues to shape it with the artillery's scatterable minefield capability, especially on the nonlinear battlefield. However, the field artillery's capability is extremely limited. A standard 400 by 400 meter minefield requires one 155 mm battery 20 minutes to fire. Since artillery survives using shoot and move techniques, artillery units would prefer to avoid firing from a fixed position for any length of time. Therefore, the engineers must retain the capability of providing countermobility support.

Can the corps wheeled combat engineer battalion serve a useful purpose? Yes, it can. First, the battalion provides a less expensive wheeled unit to commit in the rear to provide both countermobility support and sustainment engineering. A mechanized unit cannot.

Either the corps mechanized engineer battalion ends up dragging unnecessary earthmoving equipment in the battle area, slowing its supported unit's movement, or it wastes the use of tracked engineer vehicles in the tactical support area. Second, the corps commander could employ his wheeled combat engineer battalions with one of his divisions to blunt a threatening enemy penetration in a linear scenario, while continuing nonlinear operations in the corps area as a whole. The corps wheeled engineer battalion concept clearly proved itself along the northern shoulder of the Bulge in December 1944.(81)

Lastly, is it practical to consolidate all assault float bridge companies at corps? Yes, it is. Corps bridge companies control more bridge bays with fewer soldiers per bay. Thus, the Army saves money and manpower. In addition, consolidating them in the tactical support area minimizes enemy chances to range them with fires.

VIII. CONCLUSIONS

Is the proposed engineer force structure adequately suitable for AirLand Battle Future? I believe that it is. The Engineer School forged new tables of organization and equipment (TO&E) that successfully focus their combat engineer support to meet the needs of the combined arms force. These proposed TO&E's faithfully follow the four tenets of ALBF. In addition, the TO&E's meet the requirements of feasibility and practicality, considering the country's changing political and financial realities.

The maneuver brigade engineer battalion clearly provides an enormous improvement in mobility support. In addition, command and control improves significantly. However, the TO&E does contain several defects that existed in the old divisional TO&E.

The engineer battalion's continued use of the trailer-mounted mineclearing line charge does not provide a survivable system on the highly lethal battlefield. The engineer soldier who exits his track to fire the MICLIC will soon be a casualty. In addition, the battalion does not provide any dedicated engineer reconnaissance section in the combat companies to augment maneuver task force scouts with expert engineer reconnaissance. Furthermore, the CEV and the AVLB cannot fully enable the maneuver forces to exploit their mobility. It is true that the improved engineer force structure makes command and control of these two vehicle types easier. Also, their increased number to maneuver forces vastly improves engineer mobility support. However, the proposed engineer force structure does not adequately address the suspension, chassis, and power plant discrepancies that exist between the older generation of engineer equipment and the newer generation of maneuver fighting vehicles, the Abrams tank and the Bradley Fighting vehicle. It must be noted that as soon as the Army approves the BOIP for the CMV and the HAB, the TO&E will include them.(82)

The corps mechanized and wheeled engineer battalions allow the corps commander the capability to concentrate the correct type of engineer asset, mechanized or wheeled, where it is most needed on the battlefield. This characteristic makes them highly practical. In addition, the presence of mechanized engineers in the corps engineer brigade enables the corps to reinforce maneuver brigade engineers with engineer units equipped with like equipment, thus simplifying logistics. The corps wheeled engineer battalion enables the army to retain a comparatively inexpensive battalion (wheeled vehicles are

cheaper to repair and operate than tracks) to operate in areas where armor protection is not vital. This battalion also succeeds in providing necessary sustainment engineering to logistical operations.

Similarly, pooling assault float bridging assets at corps allow the corps commander the capability to focus the few bridge assets available where they are most needed without delay. In addition, the intention to locate bridging assets in the tactical support area out of range of enemy indirect fire systems increases their survivability of these scarce assets.

IX. RECOMMENDATIONS

To improve the proposed engineer force structure for ALBF, I propose the following recommendations.

First, most important in ensuring that the proposed engineer force structure can fully provide mobility support on the nonlinear battlefield, the Army must fund the development and fielding of the combat mobility vehicle and the heavy assault bridge. These next generation battlefield mobility vehicles must include chassis and power plants that match the high performance standards of the Abrams tank and the Bradley fighting vehicle. This enables the engineers to keep up with the supported maneuver brigade and provide rapid, responsive mobility support.

Second, the Engineer School should develop a self-propelled armored minefield breaching vehicle with a standoff capability. This enables the supporting engineers to clear the minefield in the face of direct enemy weapons without dismounting the vehicle and stand a much better probability of surviving.

Third, the Engineer School should add a dedicated engineer

reconnaissance section to the combat engineer line company in mechanized battalions, that is, both maneuver brigade combat engineer battalion and corps mechanized combat engineer battalion.

Finally, the Engineer School should form a test unit configured as a maneuver brigade engineer battalion to determine if the battalion's authorized vehicles can actually function as planned and carry all of the authorized soldiers and equipment.

With the implementation of the Engineer School's proposed force structure, ALBF will be able to deliver an exponential increase in agility and set the right conditions for commanders to maximize initiative and generate sufficient combat power at the decisive time and place. In addition, I believe that the Engineer School should implement the above recommendations as they would go far to assist in achieving victory on the nonlinear battlefield.

AIRLAND BATTLE FUTURE BATTLEFIELD GEOMETRY

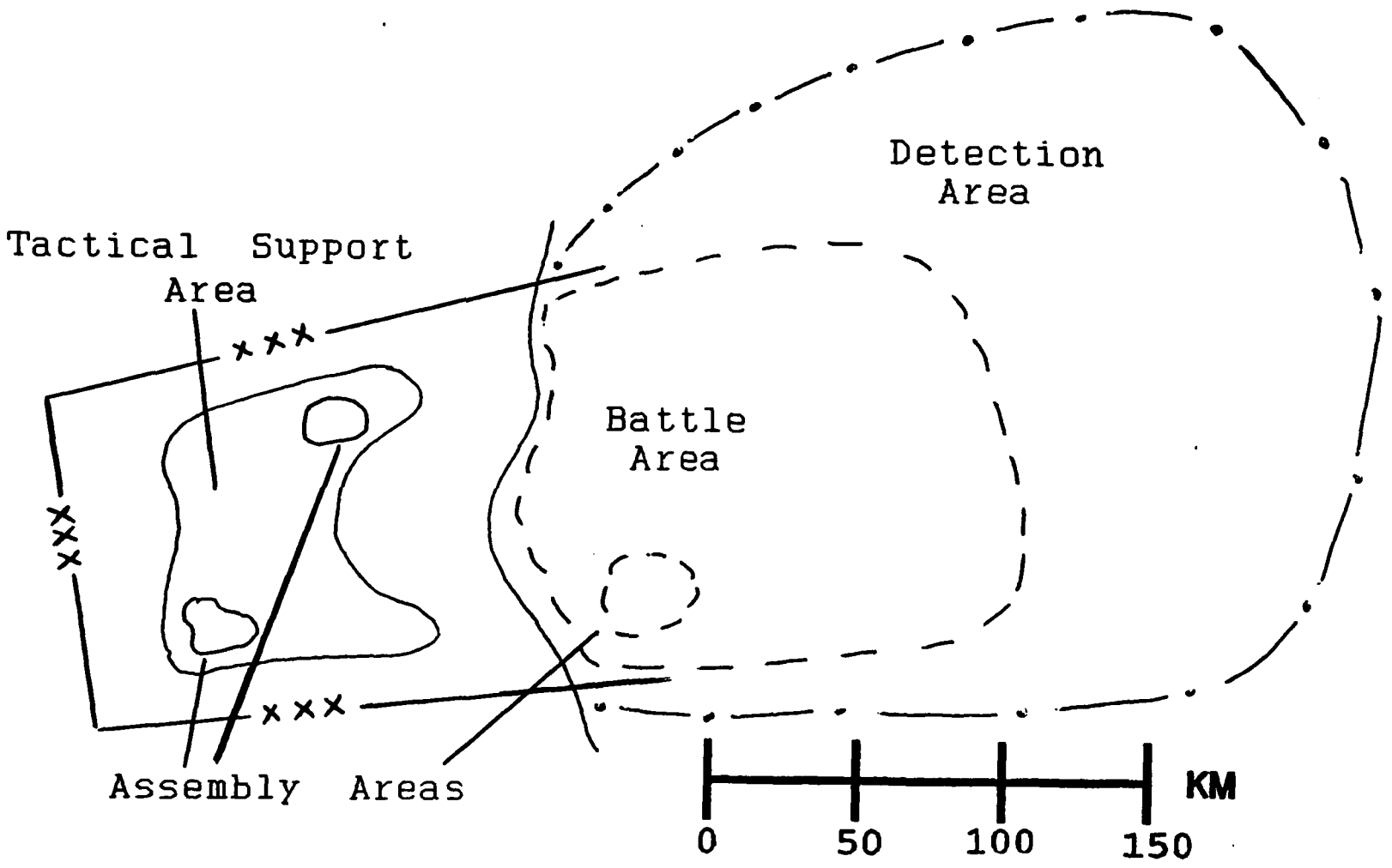

Figure 1 (83)

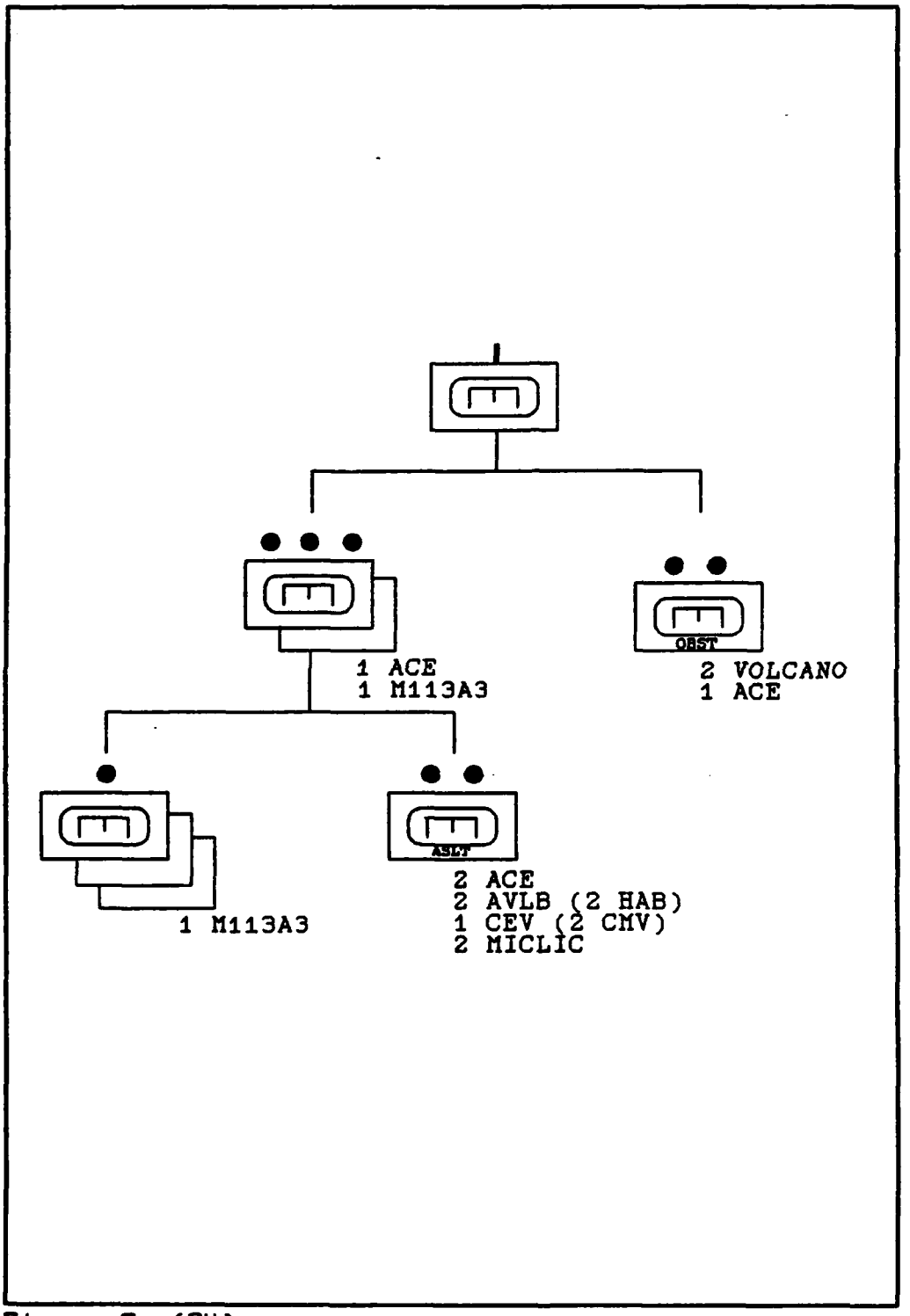

Figure 2 (84)

ENGINEER COMPANY, ENGINEER BATTALION,
MANEUVER BRIGADE

*ONLY SELECTED ITEMS OF EQUIPMENT ARE SHOWN.

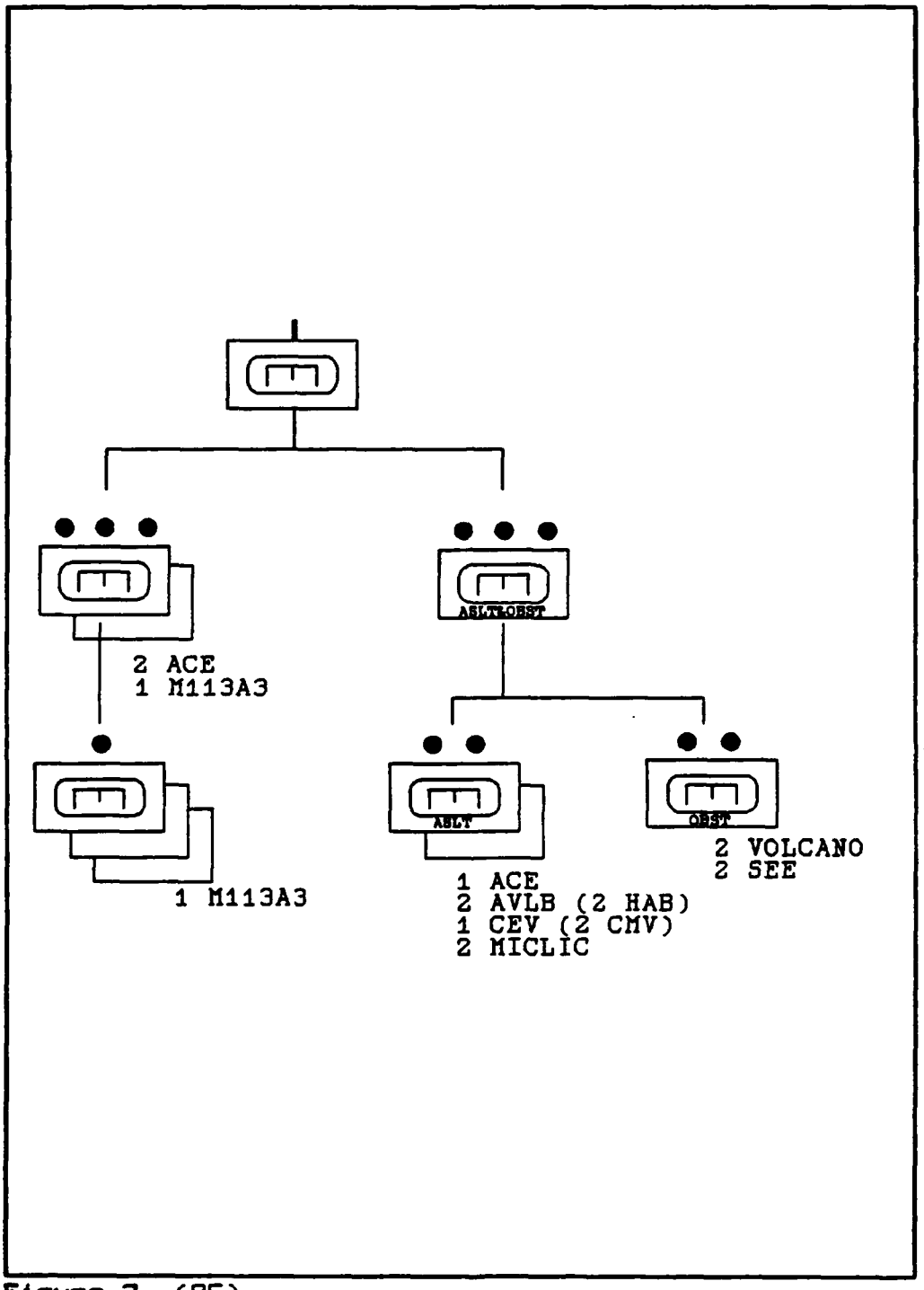

Figure 3 (85)

ENGINEER COMPANY, ENGINEER BATTALION CORPS MECH

*ONLY SELECTED ITEMS OF EQUIPMENT ARE SHOWN

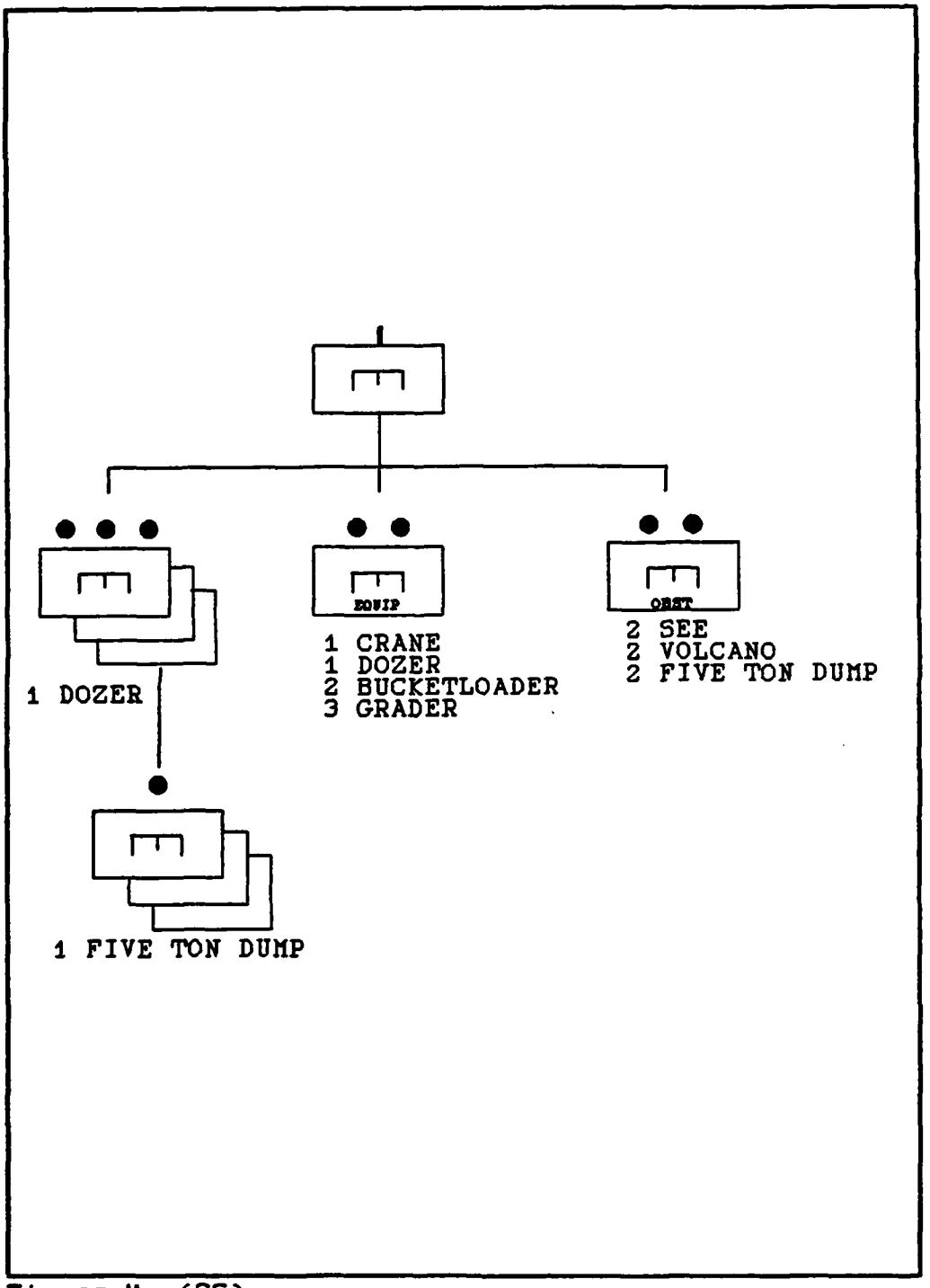

Figure 4 (86)
ENGINEER COMPANY, ENGINEER BATTALION CORPS
*ONLY SELECTED ITEMS OF EQUIPMENT ARE SHOWN
**MAINTENANCE SECTION NOT SHOWN

ACRONYMS

ACE	Armored Combat Earthmover
ACR	Armored Cavalry Regiment
ALBF	AirLand Battle Future
AVLB	Armored Vehicle Launched Bridge
BOIP	Basis of Issue Priority
CEV	Combat Engineer Vehicle
CMV	Combat Mobility Vehicle
HAB	Heavy Assault Bridge
HMMWV	High Mobility Multi Wheeled Vehicle
MICLIC	Mine Clearing Line Charge
SEE	Small Equipment Excavator
TO&E	Table of Organization and Equipment
TRADOC	Training and Doctrine Command

ENDNOTES

1. Steven Walden, et al., "The S&L Firestorm," Newsweek, 66, (23 July 1990), p. 14.

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